

REMARKS

Rejections Under 35 USC §112, first paragraph

Claims 1-11, 13, 16, 21, 22, and 40-44 have been rejected under 35 USC §112, first paragraph, as failing to comply with the written description requirement. These rejections are based on the "0.2 to 2.0 mils thickness" range recitations for the adhesive layer, on the "selecting the pressure" recitations to control the thickness of the adhesive layer, and on the "1.7 kg" recitation.

With respect to the rejections based on the thickness range recitations, the claims have been amended to remove the "0.2 to 2.0 mils thickness" recitations. In addition, claim 20 has been amended to remove the "1.7 kg" recitation. With respect to the rejections based on the "selecting the pressure" recitations, these rejections are traversed.

However, claims 1, 21 and 42 have been amended to remove the "selecting the pressure" recitations. In addition, independent claim 6 has been amended to recite "a system configured to apply a volume of the adhesive material to the leadframe or to the die and to place the die in contact with the leadframe with a pressure". Antecedent basis for this recitation is contained on page 9, line 33, to page 10, line 2 of the specification. Amended independent claim 6 also states that the placing step is performed "using the system", with "the volume and the pressure selected to form the adhesive layer with a selected thickness". Dependent claims 16, 20 and 42 include similar recitations.

It is submitted that one skilled in the art of semiconductor packaging would realize that in the context of the disclosed system, the thickness of the adhesive layer would be a function of the pressure applied to compress the die and the leadframe together. As held in In

re Naquin, 158 USPQ 317 (CCPA 1968), only a person of ordinary skill in the art to which the invention pertains need be enabled by the application disclosure. As held in In re Wilding, 535 F.2d 631, 190 USPQ 59 (CCPA 1976), undisclosed subject matter that is inherent from the disclosed subject matter can be relied upon to satisfy the enablement requirement.

As support for the "selecting the pressure" recitations, the specification states: "the system 22 can include a dispensing mechanism 46 for applying a desired volume of the instant curing adhesive material to the mounting paddles 12 (FIG. 1A) of the leadframes 14" (page 9, lines 29-32). The specification also states "the system 22 can include a die support platform 50 for placing the dice 10 in contact with the mounting paddles 12 with a required pressure (page 9, line 35 to page 10, line 10). The specification also states: "The polymerizing step (step D) occurs with the dice 10 placed in contact with the instant curing adhesive on the mounting paddles 12. With the adhesive sandwiched between the dice 10 and mounting paddles 12" (page 10, lines 3-6).

In view of the foregoing disclosure, it is submitted that one skilled in the art would recognize that the thickness of the adhesive layer is a function of the applied pressure. The specification is thus submitted to satisfy the written description requirement of 35 USC §112, first paragraph, for the "selecting the pressure" recitations in claims 6, 16, 20 and 42.

Rejections Under 35 USC §112, second paragraph

Claims 4, 11, 12-20, 22 and 42-44 have been rejected under 35 USC §112, second paragraph, as being indefinite. These recitations are based on the "75 to 100 grams" recitations as being indefinite. In order to overcome these rejections, the "75 to 100 gram" recitations have

been removed from the amended claims 4, 11, 12, 15, 22 and 42.

Rejections Under 35 USC §103

Claims 1-20 and 42-44 have been rejected under 35 USC §103(a) as being unpatentable over Krall (US Patent No. 4,713,235) in view of either Chorbadjiev et al. (article entitled "The effect of fillers upon properties of electroconductive cyanoacrylate adhesives from the International Journal of Adhesion and Adhesives July 1988), the admitted prior art, either one of Zwick (US Patent No. 5,690,766) or PCT WO 97/06953, and either one of Loctite 410 or Loctite 416, optionally taken with the state of the prior art as exemplified by at least one of Liang et al. (US Patent No. 5,233,131), Fogal et al. (US Patent No. 5,140,404), Farnworth (US Patent No. 5,218,229), Davis (US Patent No. 5,214,307) and German Patent 4107347.

Claims 21, 22, 40 and 41 have been rejected under 35 USC §103(a) as being unpatentable over the admitted prior art in view of either one of PCT WO 97/06953 or Zwick (US Patent No. 5,690,766) and JP 58196280.

The rejections under 35 USC §103 are traversed for the reasons to follow.

35 USC §103 Rejections Over Krall, Chorbadjiev, Zwick, Loctite 410 or 416, Liang et al., Fogal et al., Farnworth, Davis and German Patent 4107347

The 35 USC §103 rejections of claims 1-20 and 42-44 are traversed for essentially the same arguments discussed in the amendments dated October 26, 2004, and December 24, 2003. In particular, the combination of references does not teach all of the features of the presently claimed method. Additionally, one skilled in the art at the time of the invention would have no incentive to combine the references in the manner of the Office Action.

As a supplement to the above arguments, Applicant further argues that the primary reference to Krall is non analogous art. Under the case law two criteria have evolved for determining whether prior art is analogous: (1) whether the art is from the same field of endeavor regardless of the problem addressed, and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved. In re Wood, 599F.2d 1032, 202 USPQ 171 (CCPA 1979).

In the present case, Krall is directed to "Radiopaque Cyanoacrylates" for medical procedures. As such, Krall is not in the field of semiconductor packaging, and does not relate to the problem of attaching a semiconductor die to a leadframe. Rather, Krall is in the medical field, and relates to the problem of making a radiopaque cyanoacrylate for medical applications (column 1, lines 56-59). Accordingly, one skilled in the art of semiconductor packaging at the time of the invention would have no presumed knowledge of Krall, and would have no incentive to combine Krall with semiconductor packaging art.

Further, there is no disclosure in Krall that enables the use of radiopaque cyanoacrylates for semiconductor packaging. Column 1, lines 46-53 of Krall suggests that radiopaque cyanocrylates "may be a useful adhesive for joining contact leads to the chips". However, Krall does not describe the concept sufficiently to have placed it in possession of one of ordinary skill in the field of semiconductor packaging.

As held in In re David C. Paulsen, 30 F.3d 1475, 31 USPQ 2d (BNA) 1671, (U.S. App 1994): "A proper 35 USC §102 rejection requires that each and every limitation of the claimed invention be disclosed in a single prior art reference. In addition, the reference must be enabling and

describe the applicant's claimed invention sufficiently to have placed it in possession of a person of ordinary skill in the field of the invention."

Although the present rejections are under 35 USC §103, the above holding is believed to be applicable, as Krall, even in combination with the secondary references, does not place the present invention in the possession of one skilled in the art. It is noted that the Examiner regards the present disclosure as not satisfying the written description requirements of 35 USC §112, first paragraph, because one skilled in the art would supposedly not recognize that the thickness of the adhesive layer is a function of the applied pressure. On the other hand, a bare statement in Krall that methyl cyanoacrylates "may be a useful adhesive for joining contact leads to the chips" supports rejections under 35 USC §103 for a "method for packaging a semiconductor die". These positions at best are inconsistent, and at worst demonstrate bias.

In support of the 35 USC §103 rejections the Office Action states "the reference clearly did not refer to "wire bonding" as addressed by applicant in the response". However, the point Applicant was making was that the quoted passage from Krall is not clear and is not enabling. Specifically, the statement in Krall that "MCA may be a useful adhesive for joining contact leads to the chips" could refer to wire bonding (e.g., lead-on-chip bonding where a lead is adhesively bonded and wire bonded), TAB bonding (e.g., where an adhesive bonds a flex circuit lead to a chip), or conductive adhesive bonding (e.g., where an adhesive is also a z-axis conductive material). However, none of these bonding methods are enabled by Krall.

The Office Action further states: "The reference was silent as to what was meant by chip to lead attachment. The applicant is advised that one skilled in the art would have been expected to have basic knowledge of the art and

one skilled in the art would have been expected to use common sense and common knowledge from the art". However, the inventor Krall does not appear to be "skilled in the art" of semiconductor packaging, such that it is difficult to ascertain what is taught, even with the use of common sense and common knowledge.

In fashioning the 35 USC §103 rejections, the Examiner has interpreted the teachings of Krall in a manner that is most similar to the teachings of the present application, and most prejudicial to Applicant. However, common sense and common knowledge in the art warrant other interpretations as well. In this regard, the Examiner is requested to assess the unobviousness of the present claims from the viewpoint of one skilled in the art at the time of the invention, but without the benefit of the present disclosure.

Applicant would further argue that the use of fillers in the present method is unobvious over the prior art. In support of the 35 USC §103 rejections the Office Action states: "It would have been obvious to one of ordinary skill in the art at the time of the invention was made to utilize a cyanoacrylate adhesive to join leads of a leadframe to a semiconductor chip as such was suggested by Krall wherein the cyanoacrylate adhesive would have been known to have incorporated an electrically conductive filler". However, Krall does not mention leadframes. In addition, Krall teaches at column 2, lines 53-61 that most additives are unsuitable in radiopaque cyanoacrylate compositions. Krall further teaches at column 2, lines 23-24, that additives in the form of "iodo acids" function as anionic inhibitors and radiopaque agents. However, fillers having the function of electrical conductivity are not mentioned. Further, one skilled in the art at the time of the invention would have no reason to use conductive fillers in the radiopaque cyanoacrylate of Krall.

Applicant would further argue that performing the steps of the method using an automated system such as a die attach machine is unobvious over the art. In support of the 35 USC §103 rejections the Office Action states: "wherein the processing for attach the die to the leadframe utilized commercially available and conventional components for facilitating the automated placement of the die to the leadframe". However, Krall does not mention leadframes, nor conventional components for placing a die on a leadframe.

35 USC §103 Rejections Over the admitted art, PCT WO 97/06953 or Zwick, and JP 58196280

The 35 USC §103 rejections of claims 21, 22, 40 and 41 over the admitted prior art in view of either PCT WO 97/06953 or Zwick and JP 58196280 are traversed for essentially the same arguments discussed in the amendments dated October 26, 2004, and December 24, 2003. In particular, the combination of references does not teach all of the features of the presently claimed method.

Specifically, the cited combination does not disclose or suggest a semiconductor packaging method in which an anaerobic adhesive is used to bond a die to a leadframe. Rather, in JP 58196280 an electrically conductive paste connects terminal electrodes 4, 5 on a chip 1 to conductor patterns 6, 7 on a printed circuit board 2. Further, the cited combination does not disclose or suggest the present "polymerizing" step "without heating the die and the leadframe" in a "method for packaging a semiconductor die".

Additionally, one skilled in the art at the time of the invention would have no incentive to combine the admitted prior art, PCT WO 97/06953 or Zwick, and JP 58196280 in the manner of the Office Action. As proposed incentive for the combination the Office Actions states: "It would have been obvious to employ the quick curing

adhesives of Japanese Patent '280 in the operation of joining a chip to a leadframe as such use of anaerobic adhesives would have sped up productivity where the processing included the use of conventional die attachment operations such as those admitted by applicant's admitted prior art".

However, JP 58196280 teaches using an electrically conductive paste for "fixing a part such as an electronic element chip to a substrate keeping the electrical conductivity to the substrate in a short time at normal temperature without using a temporary bonding process". This short curing time would be similar to the time required to harden a solder alloy in a conventional solder bonding process. Applicant does not agree that one skilled in the art would read JP 58196280 and infer that a die bonding process in a semiconductor packaging method would be sped up with an anaerobic adhesive. Particularly, where conventional heat curing of an adhesive can be accomplished in minutes, and JP 58196280 teaches a similar curing time of "a few to scores of seconds".

Conclusion

In view of the amendments and arguments, favorable consideration and allowance of claims 1-22, and 40-44 is requested. Should any issues remain, the Examiner is asked to contact the undersigned by telephone.

DATED this 6th day of April, 2005.

Respectfully submitted:



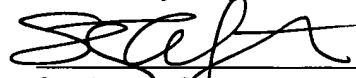
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